

3.15 Multiple Angle Equations

Name _____ Date _____ Period _____

Find all real numbers that satisfy the equation. Write answers in terms of π .

1. $\cos\left(\frac{x}{2}\right) = \frac{1}{2}$

2. $\cos(3x) = 1$

3. $2\sin\left(\frac{x}{2}\right) - 1 = 0$

4. $2\sin(2x) = -\sqrt{2}$

5. $\tan(2x) = \sqrt{3}$

6. $\tan(4x) = 0$

Find all values of α in $[0^\circ, 360^\circ)$ that satisfy each equation.

7. $2\sin(2x) + \sqrt{3} = 0$

8. $2\cos(2x) + 1 = 0$

9. $\sqrt{2}\cos(2x) - 1 = 0$

10. $2\sin(2x) - 1 = 0$

Find all real numbers in the interval $[0, 2\pi)$ that satisfy each equation.

11. $2\cos(2x) - 1 = 0$

12. $\tan(3x) - 1 = 0$

13. $\sqrt{3}\tan\left(\frac{x}{2}\right) - 1 = 0$

14. $\sqrt{2}\sin\left(\frac{x}{3}\right) - 1 = 0$

Find all values of α in degrees that satisfy each equation. Round approximate answers to the nearest tenth of a degree.

15. $\sin(3\alpha) = 0.34$

16. $\cos(2\alpha) = -0.22$

17. The vertical position of a floating ball in an experimental wave tank is given by the equation

$x = 2\sin\left(\frac{\pi}{3}t\right)$, where x is the number of feet above sea level and t is the time in seconds. For what values of t is the ball $\sqrt{3}$ ft above sea level?

18. Find the value of each expression without using a calculator.

a) $\arcsin\left(-\frac{1}{2}\right)$

b) $\cos^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

c) $\tan^{-1}(1)$

d) $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

19. Find the period, asymptotes, and range for the function $y = \cot\left(2x + \frac{\pi}{2}\right)$.